U.S. Fish and Wildlife Service
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Fisheries Resource Monitoring Program

Pikmiktalik River Salmon Escapement Enumeration And Sampling Project, 2003

Final Report for Study 02-020
Phase II

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ABSTRACT

Much of the salmon subsistence harvest of the communities of Stebbins and St. Michael occurs on the Pikmiktalik River. This river is part of the Yukon Delta National Wildlife Refuge, and is the site of one of only a few Federal subsistence fisheries in the Norton Sound area. Local residents strongly feel that availability of in- and post-season escapement information would improve management of these fishery resources. Kawerak, Inc., in cooperation with the Stebbins and St Michael IRAs, conducted a salmon escapement enumeration and sampling project on the Pikmiktalik River from June 18 to August 6, 2003. This project provided baseline information regarding salmon abundance, run-timing and biological (age, sex, and length) data to the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game. Total estimated escapements were 345 chinook *Oncorhynchus tshawytscha*, 7,707 chum *O. keta*, 13,165 pink *O. gorbuscha*, and 87 coho *O. kisutch* salmon. Additionally, a total of 527 Dolly Varden *Salvelinus malma* and 915 whitefish *Coregonus sp. were recorded.* Age, sex and length data collected from chum salmon indicated that the most abundant age class was 4 year olds (produced by 1999 brood year) which accounted for 82.8% of the total sample and represented 6,381 of the estimated escapement. The ratio of male to female chum salmon was about 50:50. Males were generally longer than females, and older salmon were generally longer than younger salmon. Continuation of this project in future years would provide valuable escapement data for use in management of these fisheries resources.

KEY WORDS: Pikmiktalik River, Yukon Delta National Wildlife Refuge, chum salmon, *Oncorhynchus keta*, chinook salmon, *Oncorhynchus tshawytscha*, pink salmon, *Oncorhynchus gorbuscha*, salmon spawning, subsistence

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INTRODUCTION

Much of the subsistence harvest of fish for the communities of Stebbins and St. Michael is of salmon stocks on the Pikmiktalik River. However, until now there were no projects that provide estimates of the number of chinook, chum (summer and fall), pink or coho salmon entering this river to spawn. Local residents strongly feel that availability of in- and post-season escapement information would improve management of these fishery resources.

Stebbins Community Association received funding from the Native American Rights Fund to conduct surveys of local salmon systems during August 1995. Mr. Morris J. Coffey was the principal investigator for this work. Ground and aerial surveys to count salmon in the Pikmiktalik and Kogok Rivers were conducted with the use of boats and a helicopter. Test fishing was also done in the southern Norton Sound area for pink salmon. Information was sent to the Alaska Department of Fish and Game, Division of Commercial Fisheries, Area Office in Nome for use in the management of the salmon fisheries. U.S. Fish and Wildlife Service, National Park Service and Stebbins Community Association conducted a preliminary study (FIS 02-020) 2002 to assess the feasibility of visually counting salmon and to select possible project sites (Lean et al. 2003) The goal of the 2003 project was to obtain daily and annual estimates of salmon entering this system to improve management of important fishery resources for local subsistence users.

OBJECTIVES

The 2003 season represents the first year that Kawerak Inc. operated a salmon enumeration and sampling project on the Pikmiktalik River. The objectives for the 2003 season were as follows:

1. Install tower, weir and flash panel at the counting site.
2. Provide daily and total annual estimates of salmon passing the counting site.
3. Provide estimates of the age, sex, and size composition of salmon passing the counting site.
4. Record weather and water conditions at the salmon counting site.
5. Provide estimates of the age, sex, and size composition of salmon harvested in the river by the subsistence fishery.

METHODS

Project weir and tower installation occurred on June 16, 2003. Crew size was three and consisted of a Lead Fisheries Technician, and two Fisheries Technicians. Counting began on June 18, 2003 and continued until August 6, 2003. The Pikmiktalik River Tower site was the preferred location identified by Lean et al. (2003; Figure 1).

Design and Construction

The counting tower apparatus consists of one 15-foot high scaffold tower. This tower had a counting platform at its uppermost level and was guyed to earth anchors for stability. Construction and installation of this prefabricated, commercially available tower conformed to OSHA standards.

A partial diversion weir was constructed according to the standard portable weir design currently used in Norton Sound (Rob 1995). It consists of steel tripod supports, aluminum stringers and schedule 40 aluminum structural pipe for pickets. Galvanized pipe was not used to avoid possible toxic effects on fish and aquatic life. Picket spacing was approximately 2 5/8", and the weir was held up with a panel of steel fence posts connected with cable and sandbags placed on the river bottom. The panel slightly overlapped the toe of the picket weir and continued in a straight line to the bank on which the tower was placed. Cable clamps were periodically placed along the cable so that the fence posts remained spread out and the panel remained straight.

Installation and Operation

An observer counted salmon from the top of the tower for 20 minutes every hour. Counting began at the start of each hour and continued for 20 minutes. Numbers of salmon and other fishes, by species, were recorded on a hand tally counter. Salmon and other fishes passing downstream were subtracted from the count. Dead or dying fish drifting downstream past the counting site were not subtracted from 20-minute upstream counts, as they were not likely to swim upstream past the site again. Numbers from the hand tally counter were recorded in a logbook, and, at the end of the counting day, expanded by 3 to estimate total passage for each hour. The 20-minute counting schedule occurred 24 hours a day, 7 days per week. The expanded daily count was transferred to a daily enumeration sheet and relayed to the Kawerak, Inc. Fisheries Department office via radio the following day. Daily total salmon counts were submitted by radio and satellite phone to the Stebbins IRA office during weekdays and to the Kawerak, Inc. Fisheries Department on weekends. Kawerak, Inc. provided data to Alaska Department of Fish and Game for their use and public distribution.

Care was taken to inspect, maintain, and clean debris, including salmon carcasses, from the weir on a regular basis. This ensured that fish could not pass through the weir undetected, and that debris load did not cause the weir to fail.

River stage height (cm), meteorological observations, and water temperatures (degrees C) were recorded at 0800 and 2000 hours each day. These data were entered on data sheets kept in a binder in the camp cabin.

Biological Sampling

Biological information was only collected for chum salmon. A pulse sampling design was used to collect this information (Molyneaux and DuBois 1999). The sample size goal for each pulse was 200 chum salmon. This sample size was selected so that simultaneous 95% confidence interval estimates of age composition proportions would be no wider than 0.20 (Bromaghin 1993). Recommended sample size was increased 9% to account for unreadable scales. Each pulse sample was used to estimate the age, sex, and length composition of the run for a given temporal stratum. A weighted mean, with chum salmon passage during each defined stratum as the weight, was used to estimate age composition of the total season passage. Chum salmon to be sampled were collected using rod and reel fishing equipment when tides were high and beach seines when tides were low. For each salmon sampled, sex was determined from external characteristics, length was measured to the nearest 0.5 cm from the middle of the eye to the fork of the tail, and a scale was collected from left side. To avoid sampling the same chum salmon again, the adipose fin was removed prior to release.

Length summary statistics (mean, standard error, range) for each salmon species were reported by sampling stratum and age-sex category. The overall season mean was estimated by weighting stratum mean lengths by total passage of each species during that stratum.

Scales were collected from the left side of salmon, approximately two rows above the lateral line in the area crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). All scales removed were visually checked for damage and regeneration, and to make sure it was not taken from the lateral line, where scales would have pores or holes. If scales from the preferred area on left side of the salmon were missing, damaged, or regenerated, scales from the preferred area on the right side were collected. If scales could not be collected from the preferred area on either side of the fish, scales as close to the preferred area as possible were collected, and this was noted as “non-preferred scale” on the data sheet. Scales were mounted on gum cards with the insertion pointing down and to the right and the sculptured side facing out. All were initially recorded in a rite-in-the-rain field notebook and then transcribed onto data sheets in a binder kept in the camp cabin.

Scales were sent to Alaska Department of Fish and Game for age determination. Prior to examination, impressions of scales mounted on gum cards were made on cellulose acetate cards using a heated hydraulic press (Clutter and Whitesel 1956). Scale impressions on acetate cards were examined with microfiche readers. Ages were determined by examining scale

characteristics (Mosher 1968). European notation was used to record ages (Koo 1962). In this system, a number preceding a decimal point refers to number of freshwater annuli and a number following the decimal refers to number of marine annuli. Total age, from time of egg deposition (often referred to as brood year) to time of capture, was the sum of these numbers plus one.

Subsistence Harvest Surveys and Sampling

Subsistence harvest information was collected in October and November using a currently existing survey instrument (See Appendix 1). As field staff did not have access to a boat, they were unable to collect age, sex, and length information from harvested chum salmon since no subsistence fishing occurred within walking distance of the field camp.

RESULTS

From June 18 to August 6, 2003, a total of 345 chinook, 7,707 chum, 13,165 pink, and 87 coho salmon were estimated to have migrated past the tower site, in addition to 527 Dolly Varden and 915 whitefish (Table 1, Figure 2).

Chum salmon migrated past the tower from June 24 through the end of the project on August 6 (Table 1; Figures 2 and 3). About 50% of the total migration occurred by July 14, and 98% by August 1. Greatest daily passage occurred on July 12, when 1,629 chum salmon were estimated to have moved upstream. Two other large abundance peaks occurred on July 4 (924 chum salmon), and July 19 (1,314 chum salmon). Net downstream movement occurred on four days: June 29, July 3, July 15, and July 22. However, daily estimated downstream passage for these four days was not great, ranging from 3 to 42 chum salmon.

A total of 354 chum salmon were sampled for age, sex, and length data, and 339 of these had usable scales (Table 2). Estimated age composition of the total spawning escapement was 82.8% age-0.3, 16.9% age-0.4, and 0.3% age-0.5 chum salmon. Females represented 51.2% of the total spawning escapement. Samples were apportioned between two strata: June 27-July 7; July 8-August 4. Sex composition was similar between these strata, with 50% females in the first and 52% in the second strata, but age composition was not. The first strata had a greater percentage of age-0.4 chum salmon (23%) than the second (8%), and age-0.5 chum salmon only occurred within the second strata (1%). Generally, chum salmon length increased with age (mean length: 573 cm age-0.3, 591 age-0.4, 610 age-0.5), and males were larger than the females of similar age.

Chinook salmon migrated past the tower from June 20 to July 27, 2003 (Table 1; Figures 2 and 4). About 50% of the total migration occurred by July 5, and greatest daily passage occurred on

July 4 when 60 chinook salmon were estimated to have moved upstream. Net downstream movement occurred on three days: June 27, June 30, and July 11. However, daily estimated downstream passage for these three days was not great, ranging from 3 to 6 chinook salmon.

Pink salmon migrated past the tower from July 2 to August 4, 2003 (Table 1; Figures 2 and 5). About 50% of the total migration occurred by July 14, and greatest daily passage occurred on July 12 when 2,439 pink salmon were estimated to have moved upstream. Net downstream movement occurred on five days: June 30, July 15, July 22, August 5, and August 6. However, daily estimated downstream passage for these five days was not great, ranging from 3 to 78 pink salmon.

Coho salmon migrated past the tower from July 29 through the end of the project on August 6 (Table 1). Total estimated passage during this time was 87 coho salmon. and the greatest daily passage of 33 coho salmon occurred on August 3.

Dolly Varden and whitefish species were observed moving up- and downstream at the tower site throughout the season (Table 1). The greatest daily passage of these fishes occurred on the first day of tower operations, June 18 when 129 Dolly Varden and 882 whitefish species were estimated to have moved upstream. Cumulative upstream passage for the season was 527 Dolly Varden and 915 whitefish species.

Water temperature generally increased from June 30 to July 19, and then subsequently decreased to the end of the counting season (Table 3, Figure 6). Recorded water temperature ranged from 9^{o}C to 17^{o}C over the course of the season. Water temperatures measured at 2000 hours were generally greater than those measured at 0800 hours, and daily differences ranged from 0 to 5 C^{o}.

Water depth did not show a strong trend over the course of the project, although depths were always greater at 0800 hours than at 2000 hours due to daily tidal influence at the tower site (Table 3, Figure 7). Recorded water depth ranges from 26 to 160 cm over the course of the season. Water depths measured at 0800 hours were always greater than those measured at 2000 hours, and daily differences ranged from 10 to 130 cm.

Daily meteorological observations were also noted while fisheries technicians' observed salmon movements on the Pikmiktalik River. This data can be seen in appendix 2.

DISCUSSION

The 2003 season represents the first time total estimates of chum, chinook and pink salmon spawning escapements were obtained for the Pikmiktalik River. The project was also notable since an Alaska Native organization, Kawerak, Inc., rather than a government agency, conducted the work. The project employed local residents as field technicians, all of whom worked the duration of the project. An alternate employee briefly replaced a technician who became ill.

The project probably documented the entire chinook and chum salmon runs into the Pikmiktalik River. When the project began on June 18, no salmon were observed moving past the counting site. It was 2 days before the first chinook was observed, 6 days before the first chum was observed, and 15 days before the first pink salmon was observed moving past the tower. When counting ended on August 6, daily numbers of chinook and chum salmon were less than 1% of their total runs. Generally, chum salmon traveled upstream in schools and seemed to be most abundant about 1 to 2 days after large high tide events. Although some coho salmon were counted, the project was designed to count chum salmon, which arrive earlier than coho salmon. Counting would probably have to continue through mid-September to encompass the coho run.

Whitefish were observed moving past the tower on a regular basis on the Pikmiktalik River. Greater numbers of whitefish were observed moving past the tower at the beginning of the season, and movements diminished by August. Although the original proposal did not include enumeration of whitefish, technicians were first trained in counting fish from the tower by observing the movements of the whitefish, which was the only species present when operations began. This data may be useful since whitefish are an important fisheries resource to local communities.

Dolly Varden were also observed passing the tower in 2003. Most Dolly Varden moved upstream at the beginning and end of the counting season. During the mid-point of the counting season they were observed moving downstream.

Although we planned to collect salmon age, sex and length information from subsistence harvests, it became increasingly clear as the season progressed that this would not be feasible. The field technicians did not have daily access to a boat for use to travel to fishing camps, and local residents, although interested in the enumeration project, did not fish near the tower site or stop by it with their subsistence harvests. Without a boat for the field technicians, future outreach activities should be developed to inform and educate local residents about the importance of age, sex, and length data and how they can help with its collection.

The Pikmiktalik River is located in the Yukon Delta National Wildlife Refuge and is the site of one of only a few Federal managed fisheries in the Norton Sound area. Management should use escapement data from the Pikmiktalik River as a foundation for decisions to ensure sustainability of these salmon runs. Additional years of escapement data would provide abundance trend information as well as some indication of production. The residents of Stebbins and St. Michael have long been concerned with the absence of salmon monitoring on the rivers they use for subsistence fishing. Therefore, they were very pleased with this project on the Pikmiktalik River, and have offered several ideas for future projects, including studies about the effects of beaver on salmon migration and production.

CONCLUSIONS

Operations in 2003 showed that it is possible to enumerate chinook, chum, and pink salmon spawning escapements into the Pikmiktalik River using a partial diversion weir and counting tower at the selected site. The success of the 2003 enumeration project was due to the productive collaboration of Stebbins IRA, St. Michael IRA, and Kawerak, Inc. Stebbins IRA effectively and efficiently administered day-to-day operations of the field camp including maintenance of food and supplies. This created a positive camp environment for the technicians, who were able to remain focused and ambitious throughout the season and to collect and record highly accurate data. Hiring local residents as field technicians also provided a valuable source of traditional knowledge of the area. Kawerak, Inc. was able to provide the technical and administrative expertise needed for overall planning, operations, data analysis, and reporting.

RECOMMENDATIONS

1. Salmon enumeration studies on the Pikmiktalik River should continue for future years to obtain data on abundance and production.

2. The project should be operated through about mid-September to obtain information on the coho salmon run. Traditional knowledge states that a strong coho run takes place, but this has not been documented.

3. Additional efforts are needed in future years to obtain age, sex, and length samples from Pikmiktalik River subsistence salmon harvests. This could include providing the field crew with a boat or training local residents to collect and submit samples from their catches.

4. Public information needs to be improved in St. Michael and Stebbins regarding activities at the Pikmiktalik River counting site. This could be done through the use of radio announcements, newspaper articles, and posters in stores and other public places.

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Danny Nashoanak and Kellen Katcheak, did outstanding work with minimum supervision to ensure the success of this project. Ryan Nashoanak worked as an alternate Fisheries Technician when needed. Expertise and some project materials were provided by the Alaska Department of Fish and Game, with special thanks to Jim Menard, Wes Jones, and Gary Knuefer. Patrick Katcheak provided and operated the boat and motor used to transport supplies and personnel to and from camp. We greatly appreciate the cooperation of Andrew Foxie Sr., for allowing use of his cabin by the technicians, and Austin Mathias, for allowing use of his land as the counting site. The U.S. Fish and Wildlife Service, Office of Subsistence Management, provided $97,361 in funding support for this project through the Fisheries Resource Monitoring Program, under contract number 7010132253.

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Table 1. Estimated daily and cumulitive numbers of all fish species, and cumulative proportions of chinook, chum and pink salmon migrating past Pikmiktalik River Tower in 2003.

	Number													
	Daily						Cumulative						Cumulative Proportion	
Date	Chinook	Chum	Pink	Coho	Dolly	Whitefish	Chinook	Chum	Pink	Coho	Dolly	Whitefish	Chinook	Chum
18-Jun	0	0	0	0	129	882	0	0	0	0	129	882	0.00	0.00
19-Jun	0	0	0	0	75	0	0	0	0	0	204	882	0.00	0.00
20-Jun	6	0	0	0	93	-126	6	0	0	0	297	756	0.02	0.00
21-Jun	0	0	0	0	24	261	6	0	0	0	321	1017	0.02	0.00
22-Jun	0	0	0	0	18	-495	6	0	0	0	339	522	0.02	0.00
23-Jun	0	0	0	0	9	30	6	0	0	0	348	552	0.02	0.00
24-Jun	3	18	0	0	0	-30	9	18	0	0	348	522	0.03	0.00
25-Jun	0	0	0	0	6	-54	9	18	0	0	354	468	0.03	0.00
26-Jun	0	0	0	0	6	-39	9	18	0	0	360	429	0.03	0.00
27-Jun	-3	0	0	0	-6	-36	6	18	0	0	354	393	0.02	0.00
28-Jun	0	6	3	0	6	-114	6	24	3	0	360	279	0.02	0.00
29-Jun	0	-3	0	0	0	15	6	21	3	0	360	294	0.02	0.00
30-Jun	-6	30	-3	0	-15	6	0	51	0	0	345	300	0.00	0.01
1-Jul	6	6	3	0	0	39	6	57	3	0	345	339	0.02	0.01
2-Jul	33	117	18	0	6	81	39	174	21	0	351	420	0.11	0.02
3-Jul	51	-12	33	0	9	-3	90	162	54	0	360	417	0.26	0.02
4-Jul	60	924	1314	0	0	0	150	1086	1368	0	360	417	0.43	0.14
5-Jul	21	25	501	0	0	27	171	1111	1869	0	360	444	0.50	0.14
6-Jul	9	141	549	0	0	27	180	1252	2418	0	360	471	0.52	0.16
7-Jul	6	54	108	0	0	6	186	1306	2526	0	360	477	0.54	0.17
8-Jul	0	387	588	0	0	267	186	1693	3114	0	360	744	0.54	0.22
9-Jul	0	129	291	0	3	-42	186	1822	3405	0	363	702	0.54	0.24
10-Jul	18	39	27	0	0	-15	204	1861	3432	0	363	687	0.59	0.24
11-Jul	-3	15	9	0	-9	0	201	1876	3441	0	354	687	0.58	0.24
12-Jul	30	1629	2439	0	3	63	231	3505	5880	0	357	750	0.67	0.45
13-Jul	3	144	439	0	3	-3	234	3649	6319	0	360	747	0.68	0.47
14-Jul	27	231	570	0	3	-9	261	3880	6889	0	363	738	0.76	0.50
15-Jul	0	-42	-18	0	2	6	261	3838	6871	0	365	744	0.76	0.50
16-Jul	18	282	213	0	9	-21	279	4120	7084	0	374	723	0.81	0.53
17-Jul	6	360	565	0	6	0	285	4480	7649	0	380	723	0.83	0.58
18-Jul	0	219	891	0	21	84	285	4699	8540	0	401	807	0.83	0.61
19-Jul	12	1314	684	0	21	-30	297	6013	9224	0	422	777	0.86	0.78
20-Jul	42	243	1089	0	33	36	339	6256	10313	0	455	813	0.98	0.81
21-Jul	0	36	321	0	9	-15	339	6292	10634	0	464	798	0.98	0.82
22-Jul	0	-12	-78	0	6	6	339	6280	10556	0	470	804	0.98	0.81
23-Jul	3	78	408	0	0	-15	342	6358	10964	0	470	789	0.99	0.82
24-Jul	0	145	453	0	18	24	342	6503	11417	0	488	813	0.99	0.84
25-Jul	0	243	699	0	0	12	342	6746	12116	0	488	825	0.99	0.88
26-Jul	0	102	234	0	0	36	342	6848	12350	0	488	861	0.99	0.89
27-Jul	3	183	282	0	0	6	345	7031	12632	0	488	867	1.00	0.91
28-Jul	0	81	84	0	0	9	345	7112	12716	0	488	876		0.92
29-Jul	0	126	114	6	3	24	345	7238	12830	6	491	900		0.94
30-Jul	0	109	93	9	18	18	345	7347	12923	15	509	918		0.95
31-Jul	0	90	81	0	3	3	345	7437	13004	15	512	921		0.96
1-Aug	0	117	98	3	0	6	345	7554	13102	18	512	927		0.98
2-Aug	0	39	24	0	0	0	345	7593	13126	18	512	927		0.99
3-Aug	0	24	27	33	6	-3	345	7617	13153	51	518	924		0.99
4-Aug	0	36	30	12	0	0	345	7653	13183	63	518	924		0.99
5-Aug	0	0	-9	12	3	0	345	7653	13174	75	521	924		0.99
6-Aug	0	54	-9	12	6	-9	345	7707	13165	87	527	915		1.00

Table 2. Age, sex, and length of chum salmon sampled, and estimated contribution to escapement Pikmiktalik River, 2003.

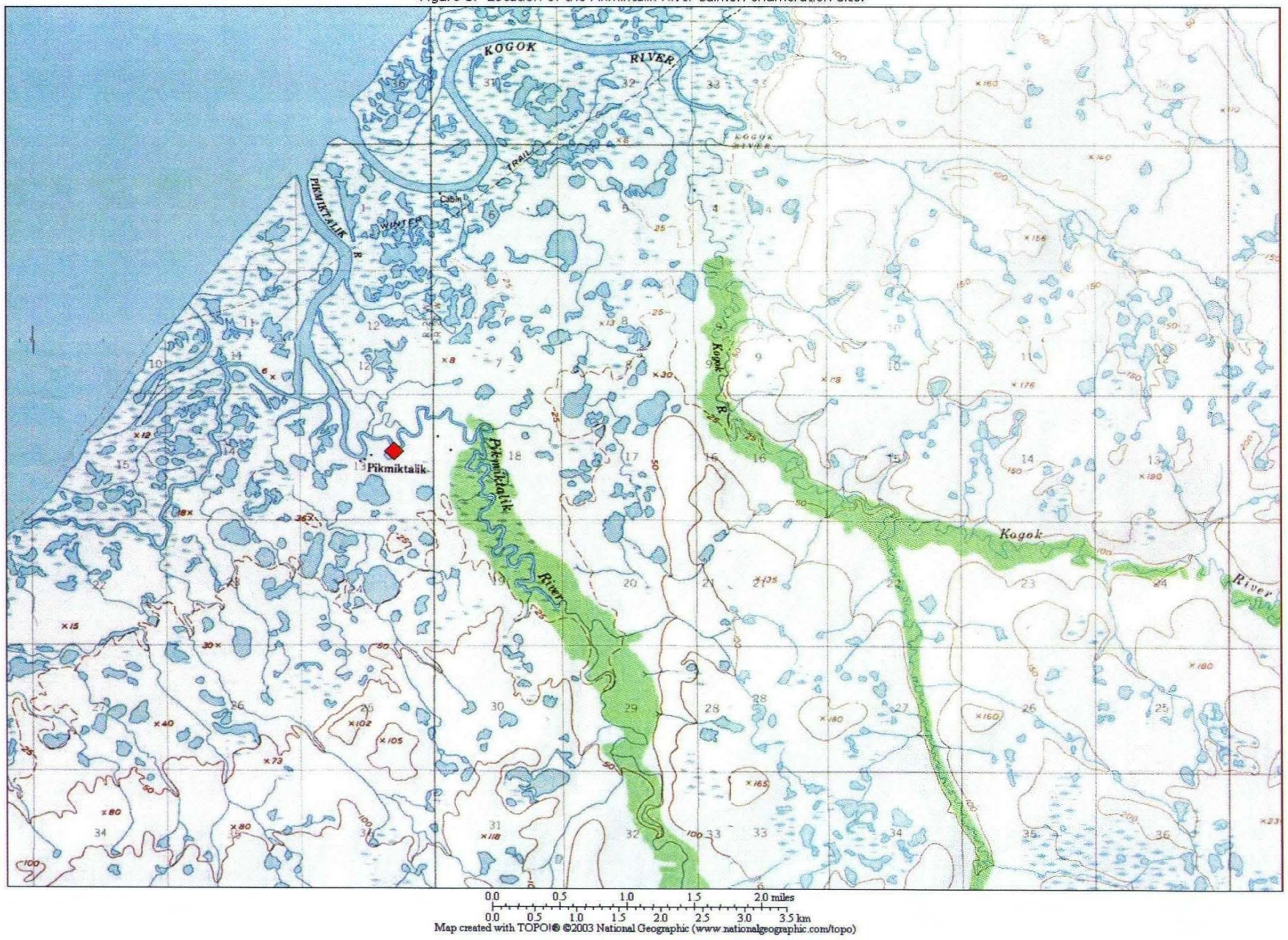
		Brood Year and Age Group[a]			
		1999	1998	1997	Total
		0.3	0.4	0.5	
Stratum Dates:	6/18 - 7/7				
Sampling Dates:	6/27 - 7/7				
Samle Size	192				
Female	Percent of Sample	38	12	0	50
	Number in Escapement	496	157	0	653
	Average Length	558	575	-	562
Male	Percent of Sample	39	11	0	50
	Number in Escapement	509	144	0	653
	Average Length	595	608	-	598
Total	Percent of Sample	77	23	0	100
	Number in Escapement	1006	300	0	1306
	Average Length	577	592	-	580
Stratum Dates:	7/8 - 8/6				
Sampling Dates:	7/15 - 8/4				
Samle Size	147				
Female	Percent of Sample	48	4	0	52
	Number in Escapement	3072	256	0	3329
	Average Length	558	570	-	559
Male	Percent of Sample	43	4	1	48
	Number in Escapement	2752	256	64	3072
	Average Length	583	605	610	584
Total	Percent of Sample	91	8	1	100
	Number in Escapement	5825	512	64	6401
	Average Length	570	588	610	572
Stratum Dates:	Season (Weighted by Strata)				
Samle Size	339				
Female	Percent of Sample	42.6	8.6	0	51.2
	Number in Escapement	3569	413	0	3982
	Average Length	558	574	0	560
Male	Percent of Sample	40.2	8.3	0.3	48.8
	Number in Escapement	3262	400	64	3725
	Average Length	590	608	610	593
Total	Percent of Sample	82.8	16.9	0.3	100
	Number in Escapement	6831	812	64	7707
	Average Length	573	591	610	576
Stratum Dates:	Season (Un-weighted)				
Samle Size	339				
Female	Percent of Sample	42.6	8.6	0	51.2
	Number in Escapement	3283	663	0	3946
Male	Percent of Sample	40.2	8.3	0.3	48.8
	Number in Escapement	3098	640	23	3761
Total	Percent of Sample	82.8	16.9	0.3	100
	Number in Escapement	6381	1302	23	7707

[a] The number of fish in each stratum age and sex category are derived from the sampling percentages; discrepancies in sums are attributed to rounding.

Table 3. Daily water temperature and depth measured at 0800 (AM) and 2000 (PM) hours at Pikmiktalik River tower site, 2003.

	Temperature (°C)		Depth (cm)			Temperature (°C)		Depth (cm)	
Date	AM	PM	AM	PM	Date	AM	PM	AM	PM
18-Jun	-	-	-	-	13-Jul	14	17	135	28
19-Jun	-	-	-	-	14-Jul	14	16	140	28
20-Jun	11	11	-	-	15-Jul	11	13	100	28
21-Jun	-	-	77	28	16-Jul	10	13	67	30
22-Jun	-	-	77	30	17-Jul	9	14	86	28
23-Jun	-	-	53	34	18-Jul	11	16	59	28
24-Jun	-	-	60	36	19-Jul	13	17	110	27
25-Jun	-	-	80	36	20-Jul	13	16	90	27
26-Jun	-	-	110	35	21-Jul	13	12	90	26
27-Jun	12	14	108	33	22-Jul	11	13	92	26
28-Jun	11	13	100	31	23-Jul	12	13	118	28
29-Jun	12	12	160	30	24-Jul	13	15	119	24
30-Jun	11	12	126	32	25-Jul	13	15	110	31
1-Jul	10	12	150	34	26-Jul	12	12	140	30
2-Jul	12	14	140	35	27-Jul	11	13	138	33
3-Jul	11	12	154	75	28-Jul	9	14	87	35
4-Jul	11	12	112	34	29-Jul	13	12	100	40
5-Jul	12	12	115	32	30-Jul	11	12	140	40
6-Jul	11	12	73	32	31-Jul	9	13	80	40
7-Jul	10	14	67	30	1-Aug	10	12	66	38
8-Jul	12	15	47	30	2-Aug	11	11	57	36
9-Jul	13	14	61	30	3-Aug	10	11	50	34
10-Jul	11	13	117	28	4-Aug	10	11	46	36
11-Jul	11	14	106	28	5-Aug	9	12	78	36
12-Jul	12	16	120	28	6-Aug	10	-	70	-

Figure 1. Location of the Pikmiktalik River salmon enumeration site.



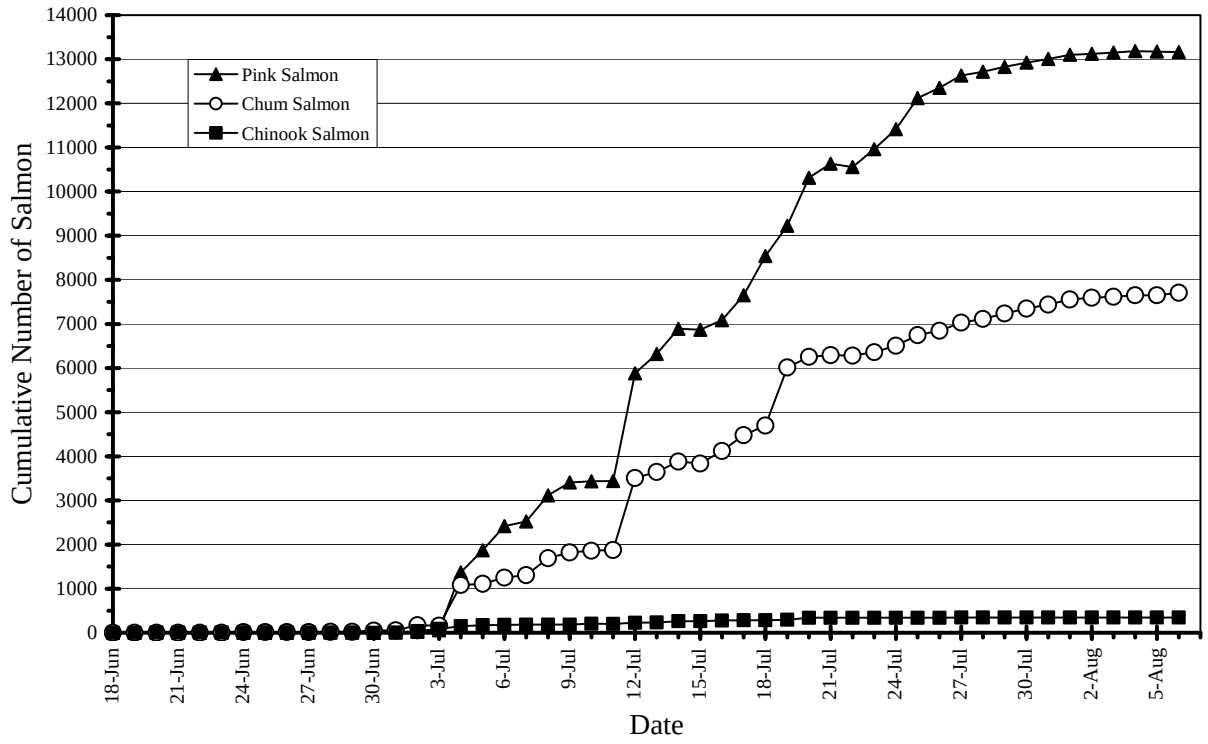


Figure 2. Cumulative number of chinook, chum, and pink salmon migrating past Pikmiktalik River tower site, 2003.

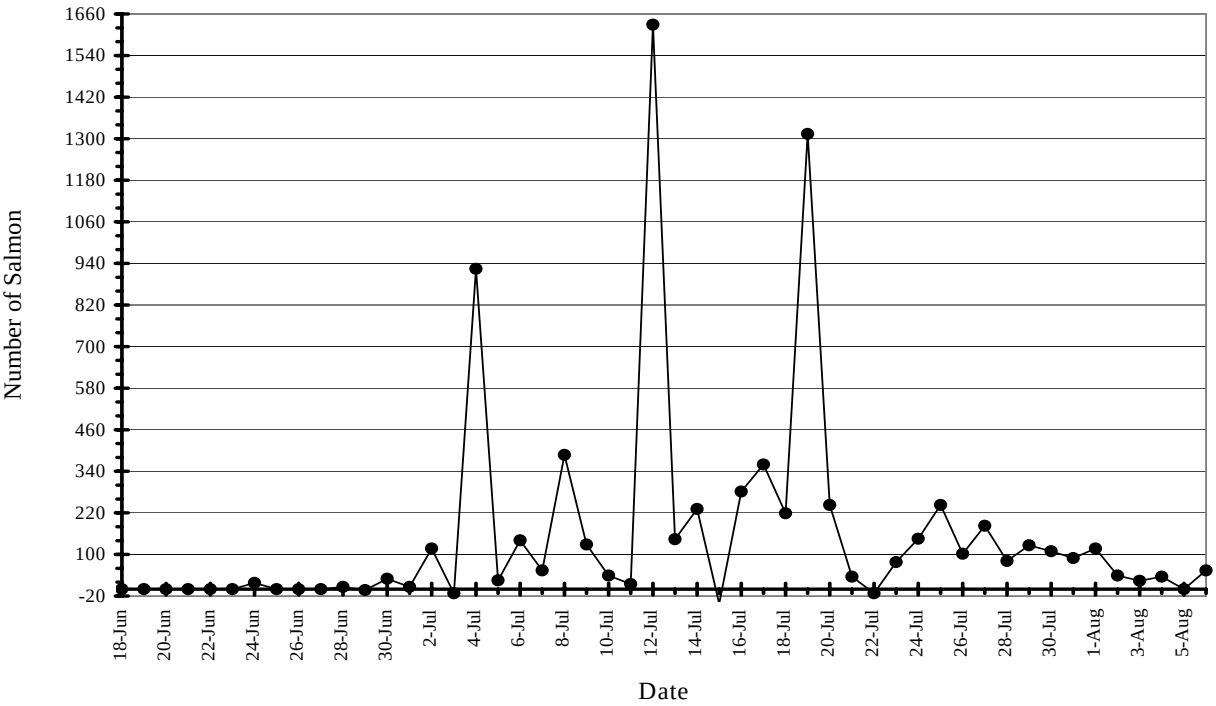


Figure 3. Daily movement of chum salmon at Pikmiktalik River tower site, 2003. A negative number indicates net downriver movement for that day.

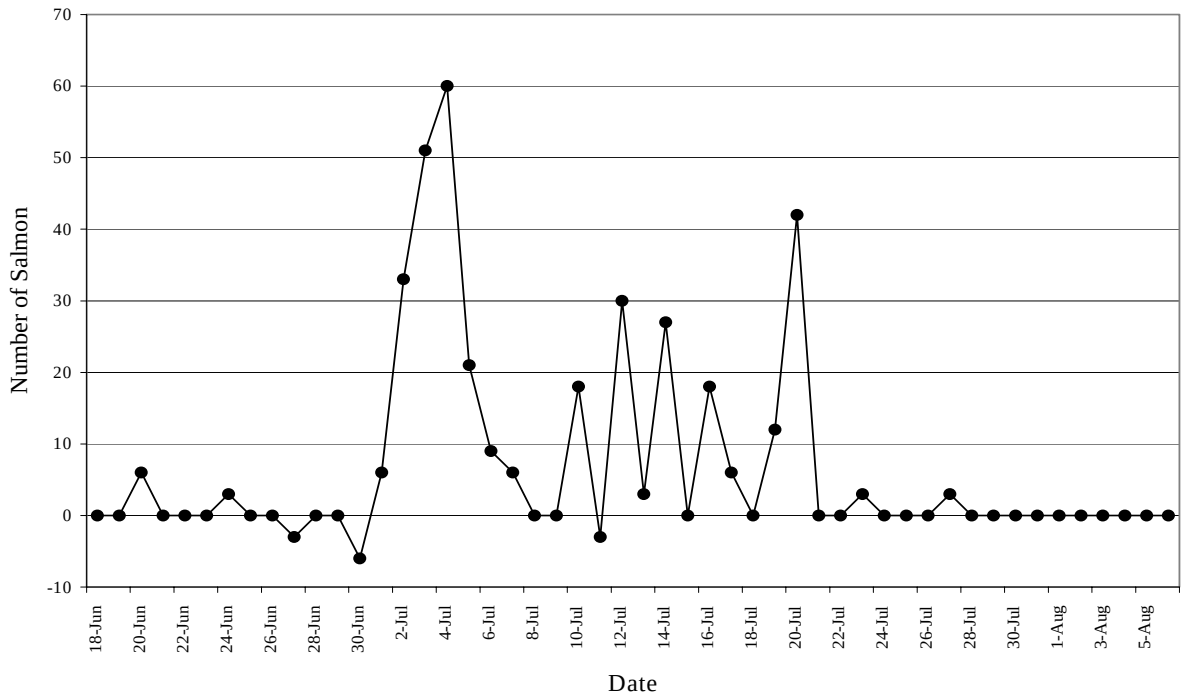


Figure 4. Daily movements of chinook salmon at Pikmiktalik River tower site, 2003. A negative number indicates net downriver movement for that day.

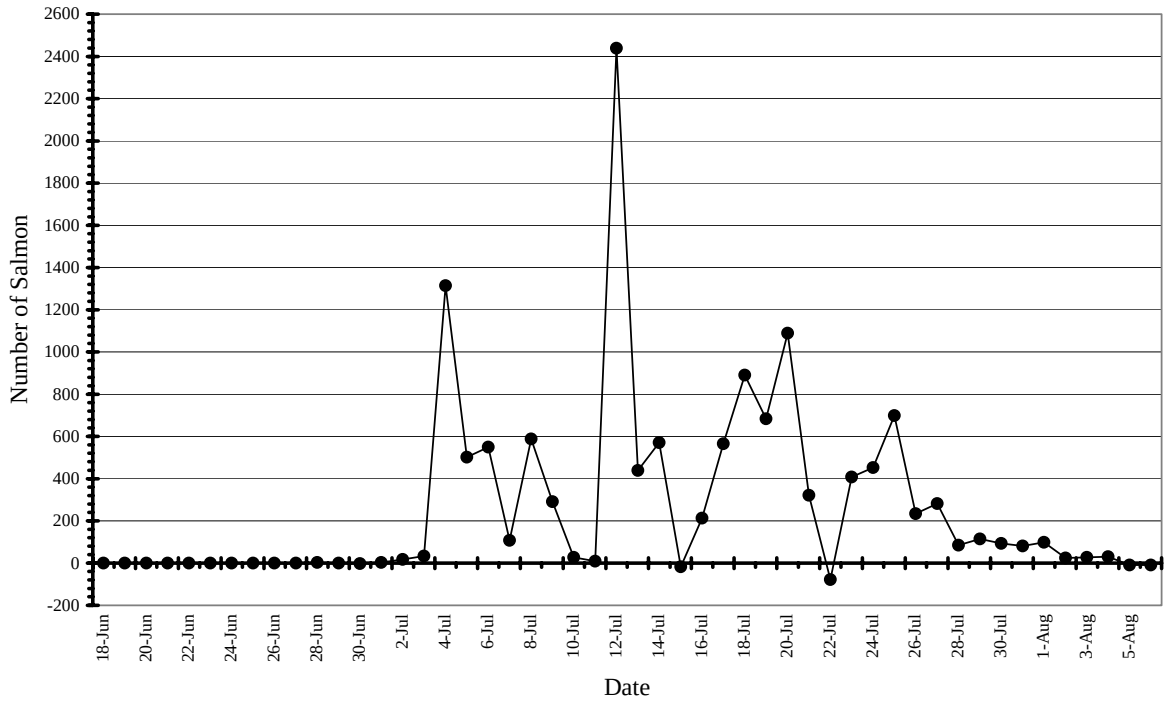


Figure 5. Daily movements of pink salmon at Pikmiktalik River tower site, June 18, to August 6, 2003. A negative number indicates net downriver movement for that day.

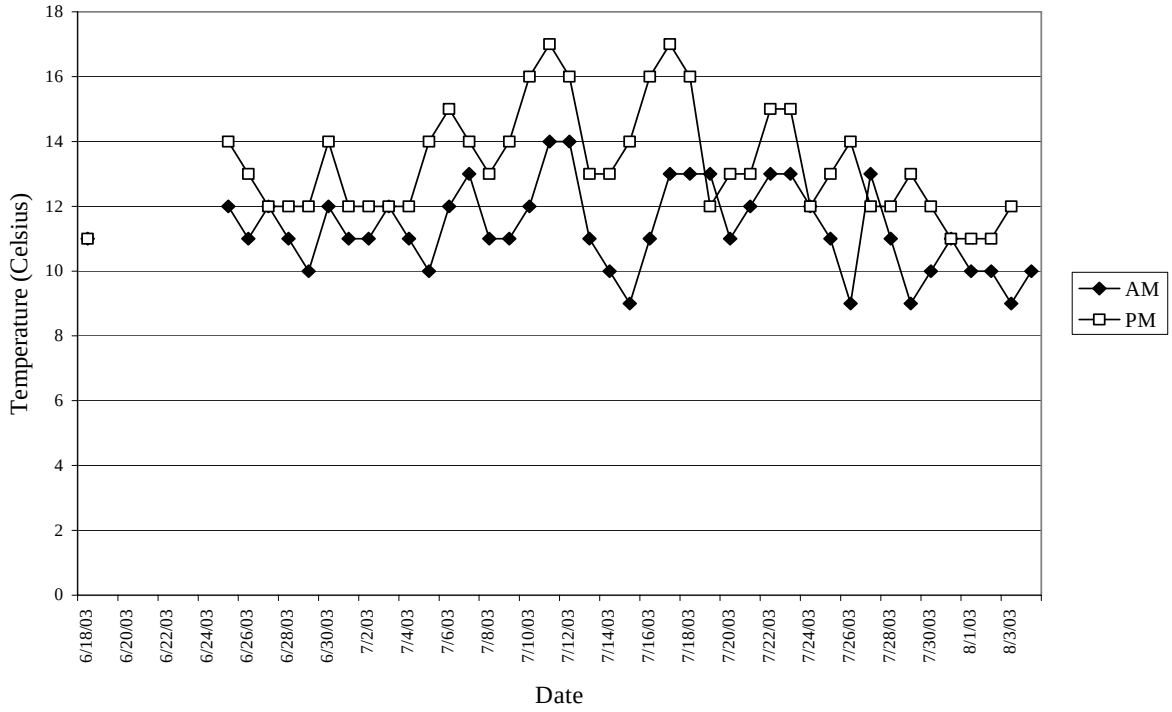


Figure 6. Water temperature recorded at 0800 (AM) and 2000 (PM) hours each day at Pikmiktalik River tower site, 2003.

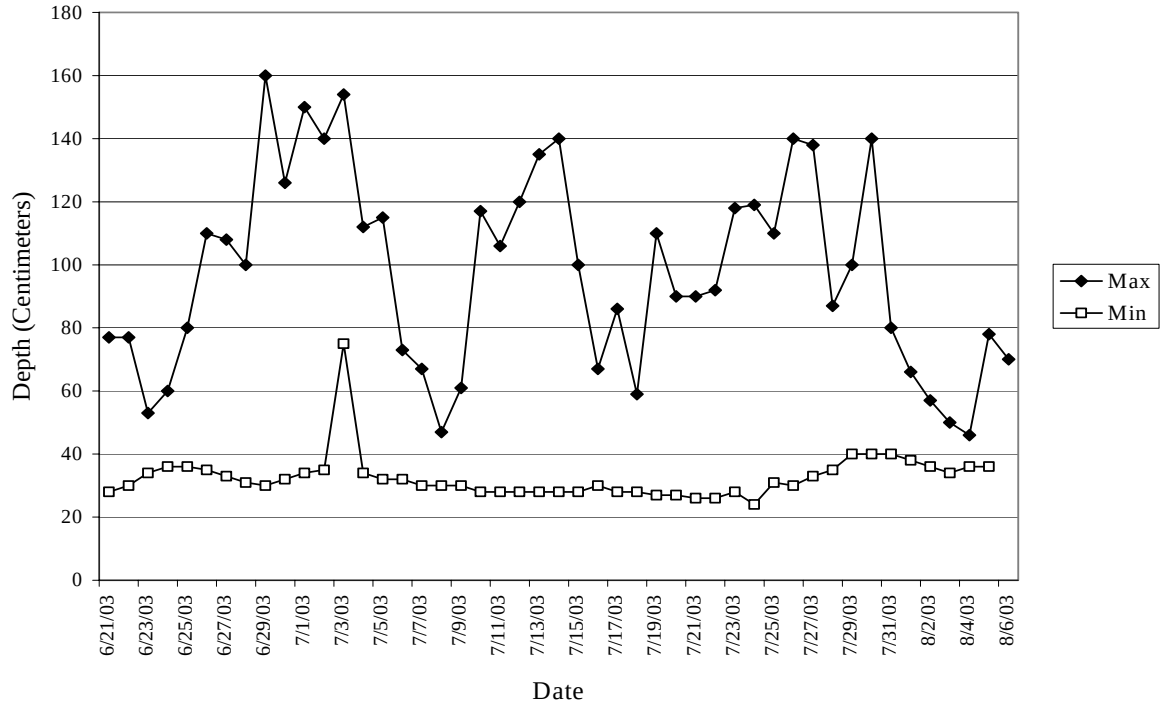


Figure 7. Water depth recorded at 0800 (AM) and 2000 (PM) hours each day at Pikmiktalik River tower site, 2003

Appendix 1. Norton Sound and Port Clarence Area 2003 subsistence salmon harvest survey.

NORTON SOUND AND PORT CLARENCE AREA 2003 SUBSISTENCE SALMON HARVEST SURVEY
Alaska Department of Fish and Game and Kawerak, Inc.

Community: _____
Survey Date: _____
Interviewer: _____

Household Size: _____
(If new household) PO Box: _____

Household participation is voluntary. Individual household data will not be released without permission of household head.

1. Did your household fish for salmon for subsistence use this year (including with a rod and reel)? o YES o NO

2. Does your household <u>usually</u> subsistence fish for salmon? o YES o NO

<u>FOR SALMON FISHING HOUSEHOLDS ONLY ("Yes" to #1)</u>

3. Please estimate how many salmon your household caught for subsistence use this year, including with a rod and reel. It is important not to double count fish harvests. Report only your share of the catch if fishing with others. Include salmon you gave away, ate fresh, fed to dogs, lost to spoilage, or obtained from helping others process fish.

NUMBER OF SALMON YOUR HOUSEHOLD HARVESTED

SPECIES	SUBSISTENCE NET or SEINE		ROD AND REEL		Salmon Kept From Commercial Fishing (Number of fish)	Of your total harvest, how many salmon were caught specifically for dog food?
	Location(s)		Number(s) of fish	Location(s)		
CHUM SALMON						
Dog						
CHINOOK SALMON						
King						
PINK SALMON						
Humpy						
SOCKEYE SALMON						
Red						
COHO SALMON						
Silver						

KEY TO HARVEST LOCATIONS

A. Agiapuk River
B. Pilgrim-Kuzitrin River
C. Niukluk R. (above tower)
D. Niukluk R. (below tower) & Fish R.
E. Kachavik Creek
F. Kwiniuk River
G. Tubutulik River
H. Koyuk River
I. Inglutalik River
J. Ungalik River
K. Shaktoolik Riv

4. How was subsistence <u>chum</u> salmon fishing for your household this year ?
o Very Good o Average o Poor If poor, why? _____

5. Did your household give salmon to other households this year? o YES o NO

Appendix 1. continued

2003 SUBSISTENCE SALMON HARVEST SURVEY (CON'T)

Based on your direct observations, the Kawerak Fisheries and Subsistence Programs would like your help identifying salmon fishery concerns. Your input is valuable and will assist staff with developing research projects to better enhance and manage the resource.

6. Please rate your level of concern regarding the following factors which may affect salmon harvest, and provide the harvest location on which you are basing your information:

	Level of Concern			Which River or Location?	Comments
	Low	Medium	High		
A) Beaver activity					
C) Disease/health of salmon					
D) River use/boat activity					
E) Non-local subsistence fishing					
F) Sportfishing					
G) Water level of river					
H) Water quality of river					
I) Spawning habitat					
J) Mining					
K) Other:					

7. Does anyone in your household trade or barter subsistence-caught fish with people in other households or communities?
o YES o NO

8. Would you be willing to be interviewed by Kawerak staff to gather more information?
o YES o NO

9. Do you have any further suggestions or concerns about subsistence fishing?

Appendix 1. Pikmiktalik River daily escapement counts from June 18, to August 6, 2003.

	modified counts									Water Temp		Gage (cm)		
date	**hours**	**hours**	**king**	**chum**	**pink**	**coho**	**sockeye**	**dolly**	**whitefish**	**AM**	**PM**	**Max**	**Min**	**Comments**
06/18/03	10	10	0	0	0	0	0	129	882					
06/19/03	24	24	0	0	0	0	0	75	0					
06/20/03	24	24	6	0	0	0	0	93	-126	11	11			
06/21/03	22	24	0	0	0	0	0	24	261			77	28	lightning
06/22/03	22	24	0	0	0	0	0	18	-495			77	30	lightning
06/23/03	23	24	0	0	0	0	0	9	30			53	34	lightning
06/24/03	24	24	3	18	0	0	0	0	-30			60	36	
06/25/03	24	24	0	0	0	0	0	6	-54			80	36	
06/26/03	24	24	0	0	0	0	0	6	-39			110	35	
06/27/03	24	24	-3	0	0	0	0	-6	-36	12	14	108	33	
06/28/03	24	24	0	6	3	0	0	6	-114	11	13	100	31	
06/29/03	21	24	0	-3	0	0	0	0	15	12	12	160	30	murky
06/30/03	24	24	-6	30	-3	0	0	-15	6	11	12	126	32	
07/01/03	24	24	6	6	3	0	0	0	39	10	12	150	34	
07/02/03	24	24	33	117	18	0	0	6	81	12	14	140	35	
07/03/03	24	24	51	-12	33	0	0	9	-3	11	12	154	75	
07/04/03	24	24	60	924	1314	0	0	0	0	11	12	112	34	
07/05/03	24	24	21	25	501	0	0	0	27	12	12	115	32	
07/06/03	24	24	9	141	549	0	0	0	27	11	12	73	32	
07/07/03	22	24	6	54	108	0	0	0	6	10	14	67	30	seining
07/08/03	24	24	0	387	588	0	0	0	267	12	15	47	30	
07/09/03	24	24	0	129	291	0	0	3	-42	13	14	61	30	
07/10/03	24	24	18	39	27	0	0	0	-15	11	13	117	28	
07/11/03	24	24	-3	15	9	0	0	-9	0	11	14	106	28	
07/12/03	24	24	30	1629	2439	0	0	3	63	12	16	120	28	
07/13/03	24	24	3	144	439	0	0	3	-3	14	17	135	28	
07/14/03	24	24	27	231	570	0	0	3	-9	14	16	140	28	
07/15/03	24	24	0	-42	-18	0	0	2	6	11	13	100	28	
07/16/03	24	24	18	282	213	0	0	9	-21	10	13	67	30	
07/17/03	24	24	6	360	565	0	0	6	0	9	14	86	28	
07/18/03	24	24	0	219	891	0	0	21	84	11	16	59	28	
07/19/03	24	24	12	1314	684	0	0	21	-30	13	17	110	27	
07/20/03	24	24	42	243	1089	0	0	33	36	13	16	90	27	
07/21/03	24	24	0	36	321	0	0	9	-15	13	12	90	26	
07/22/03	24	24	0	-12	-78	0	0	6	6	11	13	92	26	
07/23/03	24	24	3	78	408	0	0	0	-15	12	13	118	28	
07/24/03	24	24	0	145	453	0	0	18	24	13	15	119	24	
07/25/03	24	24	0	243	699	0	0	0	12	13	15	110	31	
07/26/03	24	24	0	102	234	0	0	0	36	12	12	140	30	
07/27/03	24	24	3	183	282	0	0	0	6	11	13	138	33	
07/28/03	24	24	0	81	84	0	0	0	9	9	14	87	35	
07/29/03	24	24	0	126	114	6	0	3	24	13	12	100	40	
07/30/03	24	24	0	109	93	9	0	18	18	11	12	140	40	
07/31/03	24	24	0	90	81	0	0	3	3	9	13	80	40	
08/01/03	24	24	0	117	98	3	0	0	6	10	12	66	38	
08/02/03	24	24	0	39	24	0	0	0	0	11	11	57	36	
08/03/03	24	24	0	24	27	33	0	6	-3	10	11	50	34	
08/04/03	24	24	0	36	30	12	0	0	0	10	11	46	36	
08/05/03	24	24	0	0	-9	12	0	3	0	9	12	78	36	
08/06/03	12	12	0	54	-9	12	0	6	-9	10		70		Project done
Totals			**345**	**7,707**	**13,165**	**87**	**0**	**527**	**915**					

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